A GPM-DPR Neural Network falling snow retrieval: Evaluation and comparison against CloudSat

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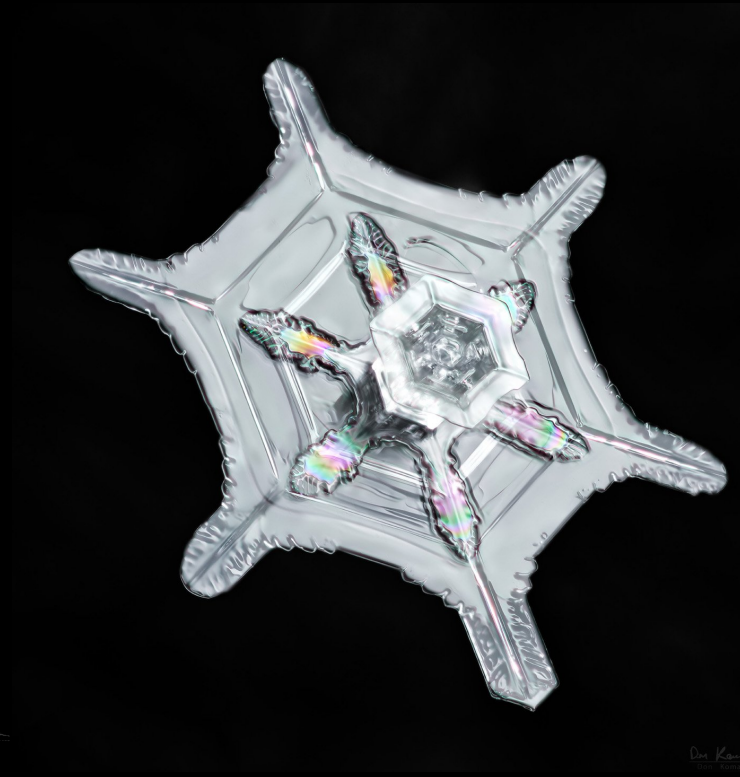
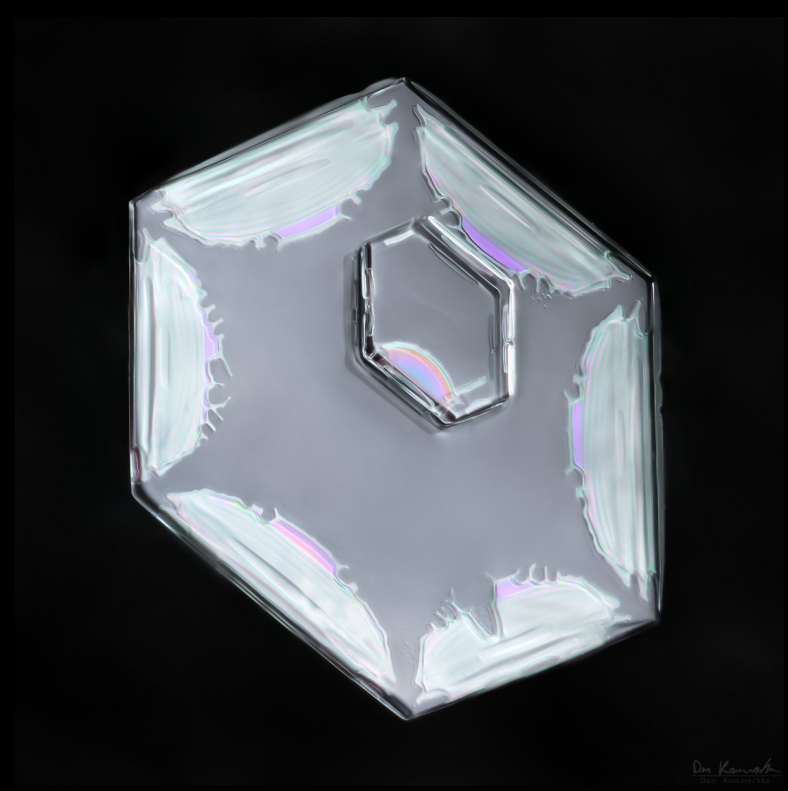
*presenting author

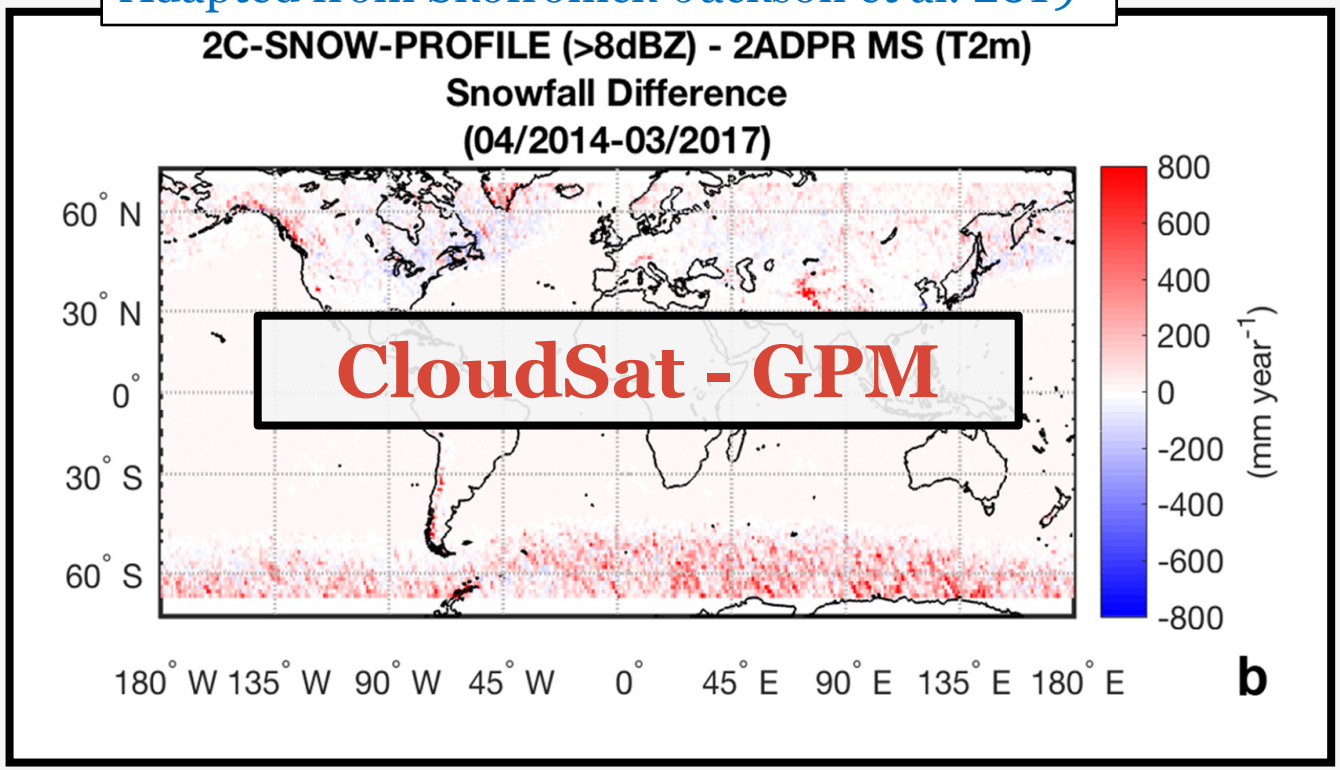




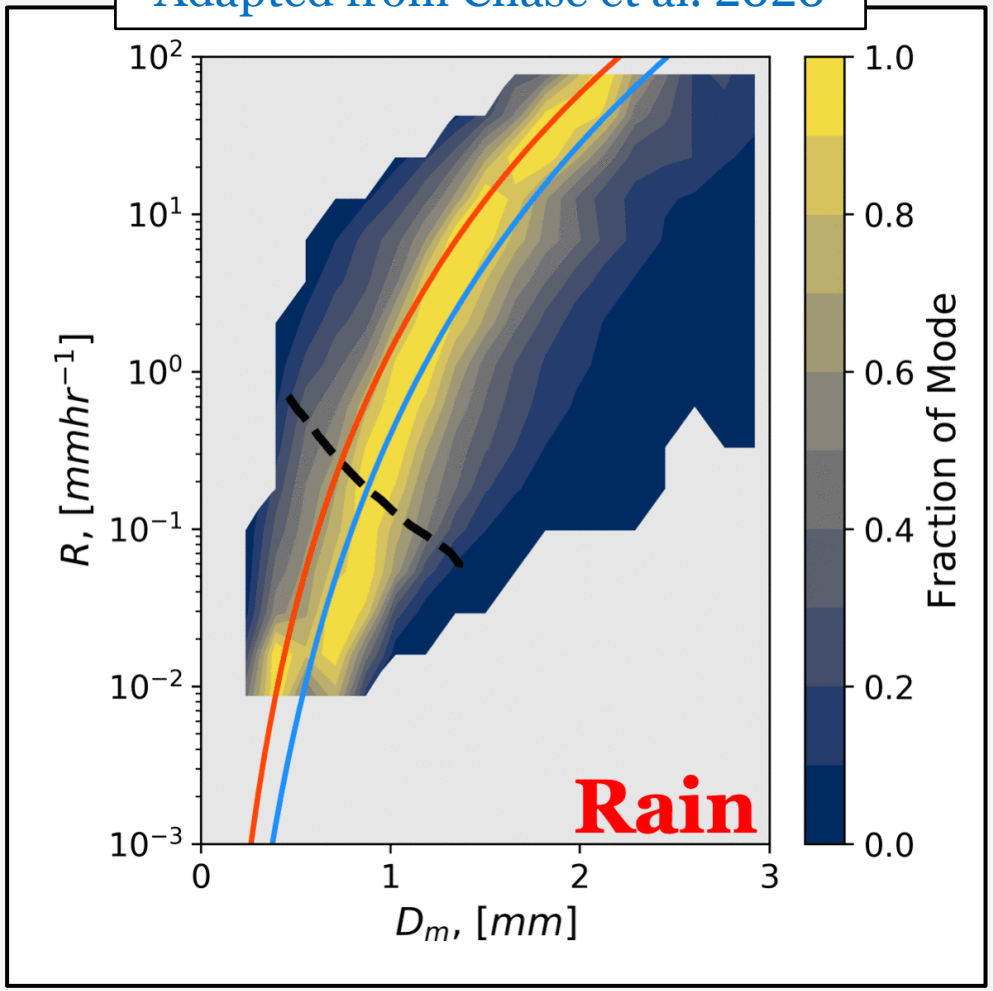
Crystal Pictures by Don Komarechka @donkom, doncom.ca

GPM-DPR estimates of R are low (Casella et al. 2017; Heymsfield et al. 2018; Skofronick-Jackson et al. 2019)

Adapted from Skofronick-Jackson et al. 2019

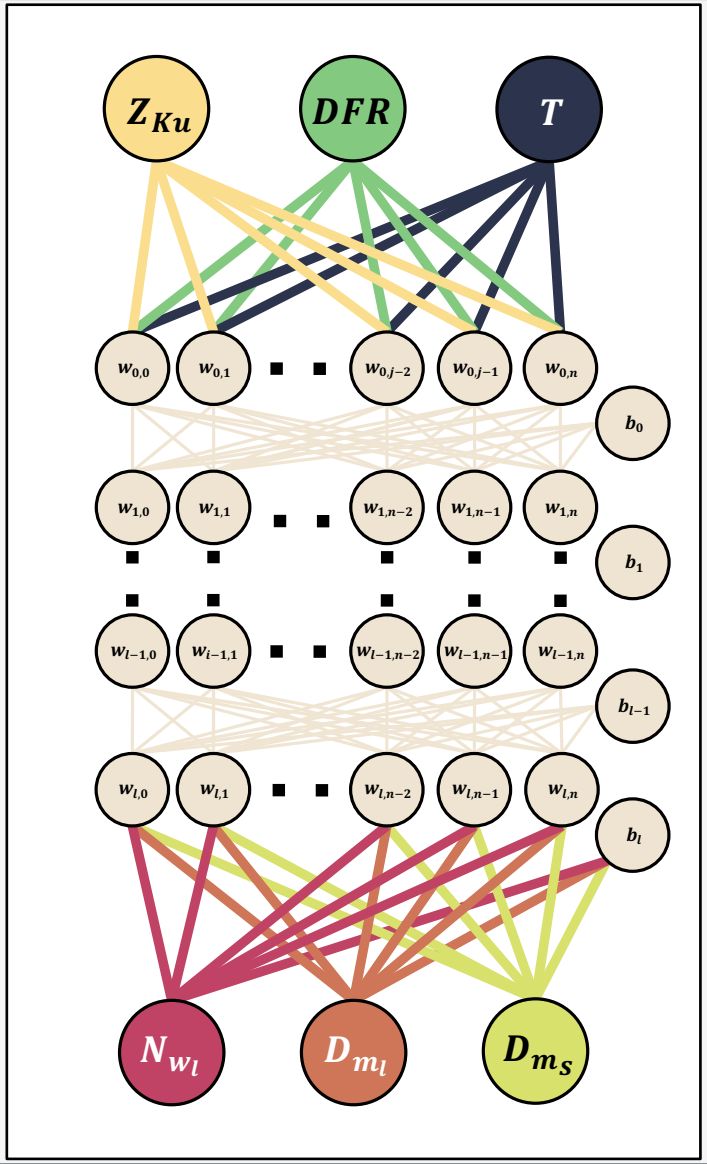


Adapted from Chase et al. 2020



We suggest an alternative method

Adapted from Chase et al. *in review*



← Inputs observed Z_{ku} , observed DFR_{Ku-Ka} and T

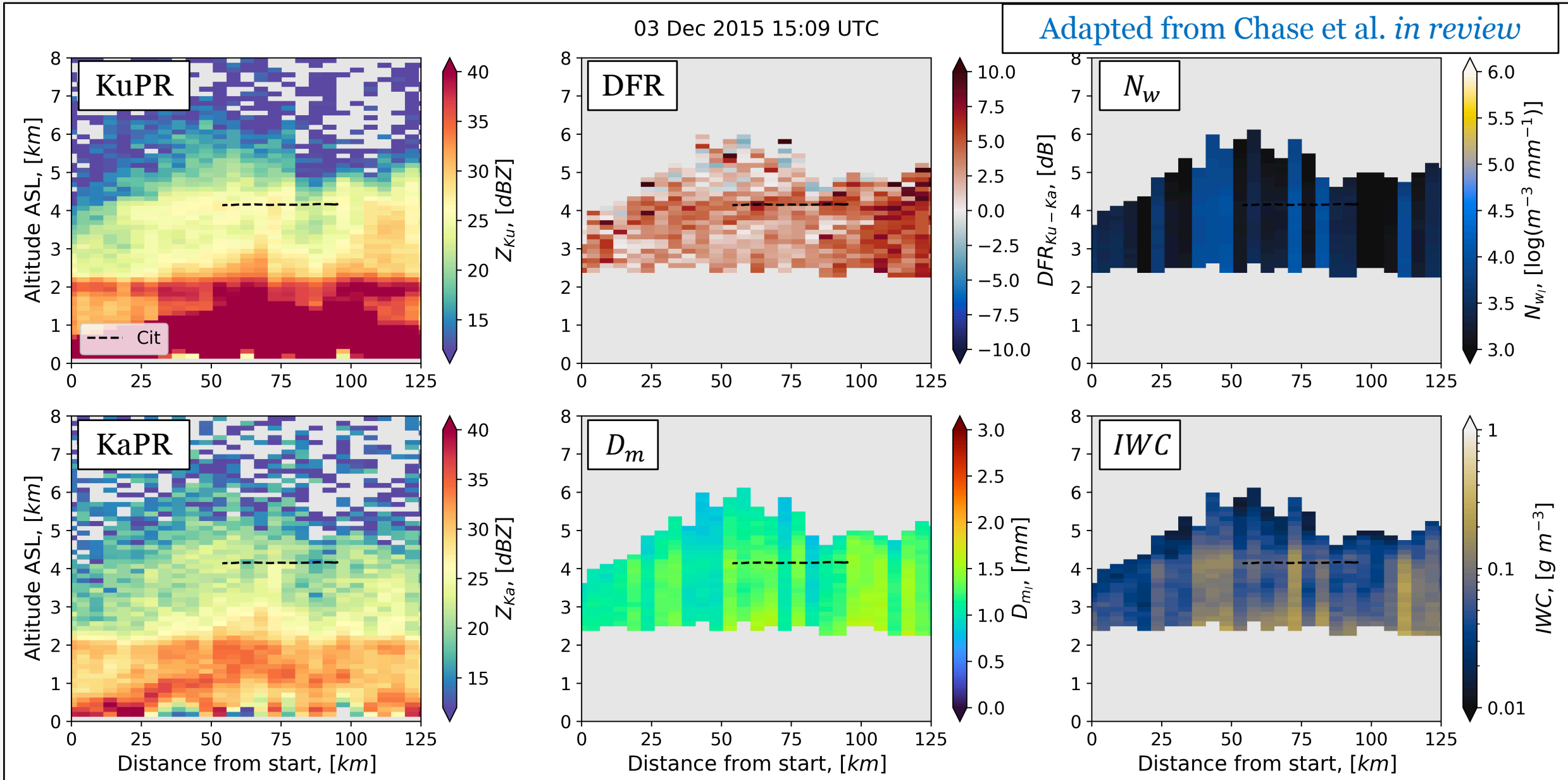
Weights and biases trained by a database made from measured PSDs and a collection of unrimed DDA/GMM particles

← Outputs Liq. Eq. N_w, Liq. Eq. D_m and solid phase D_m

OLYMPEX Case 03-Dec-2015

2ADPR v06

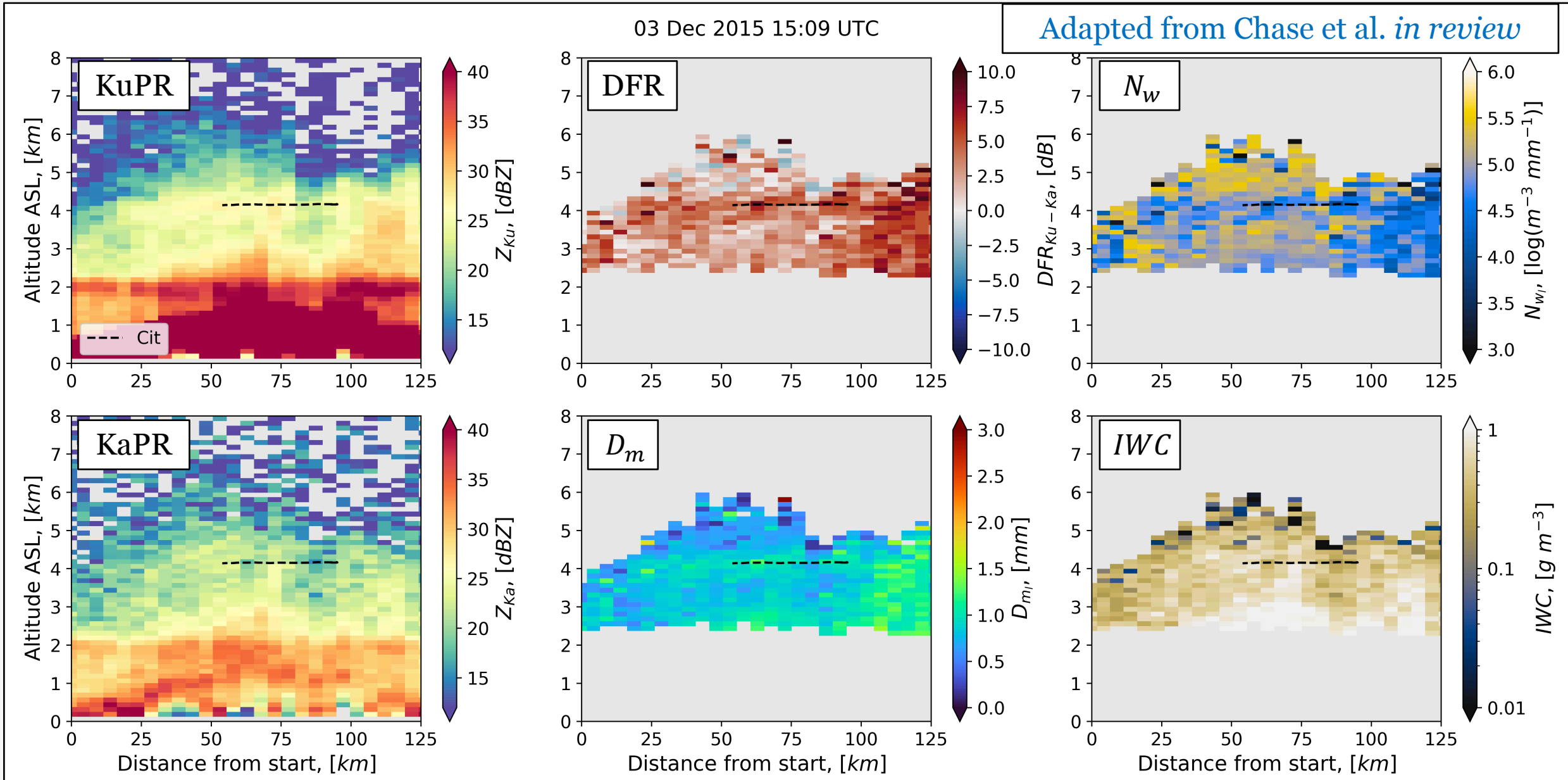
Adapted from Chase et al. *in review*



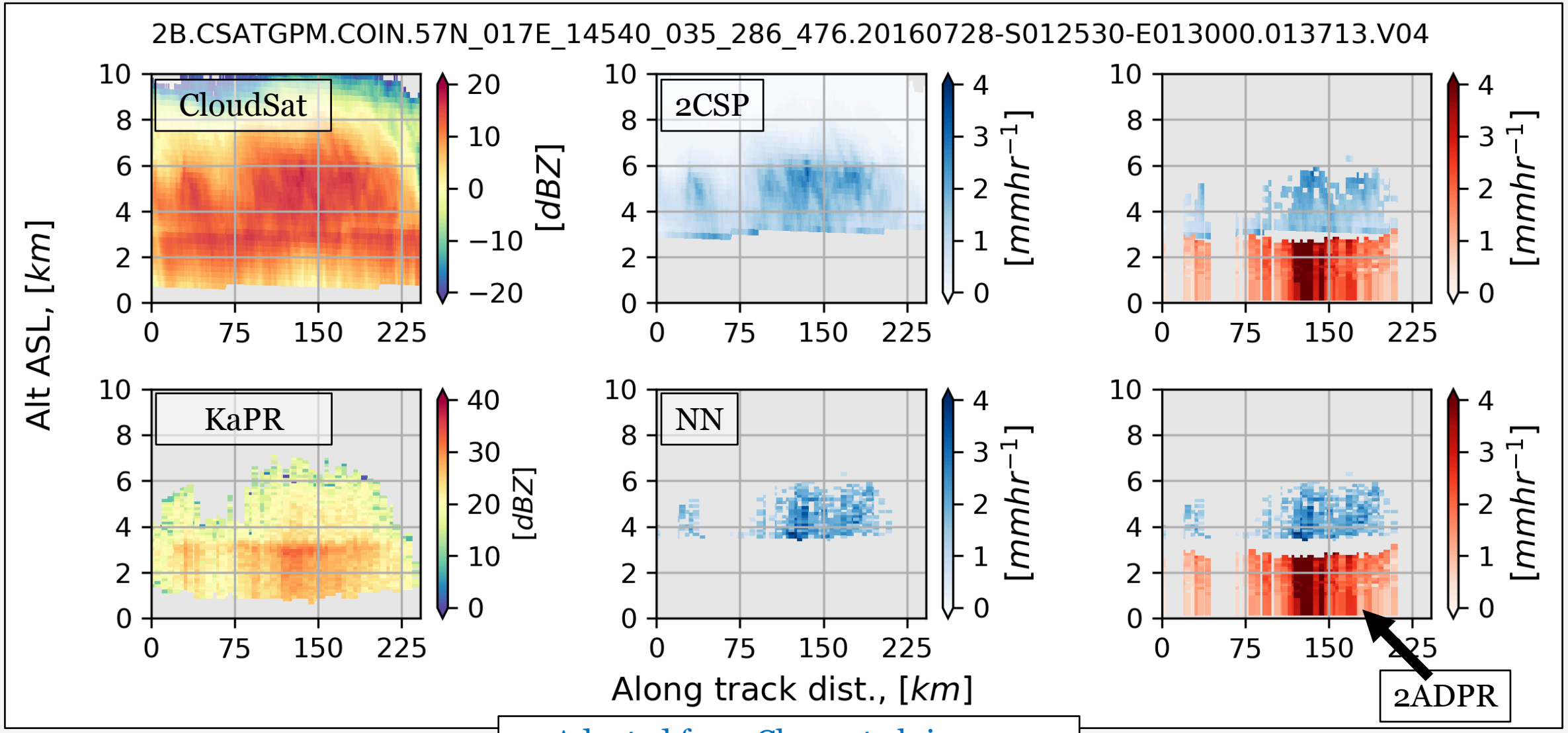
OLYMPEX Case 03-Dec-2015

Neural Network

Adapted from Chase et al. *in review*

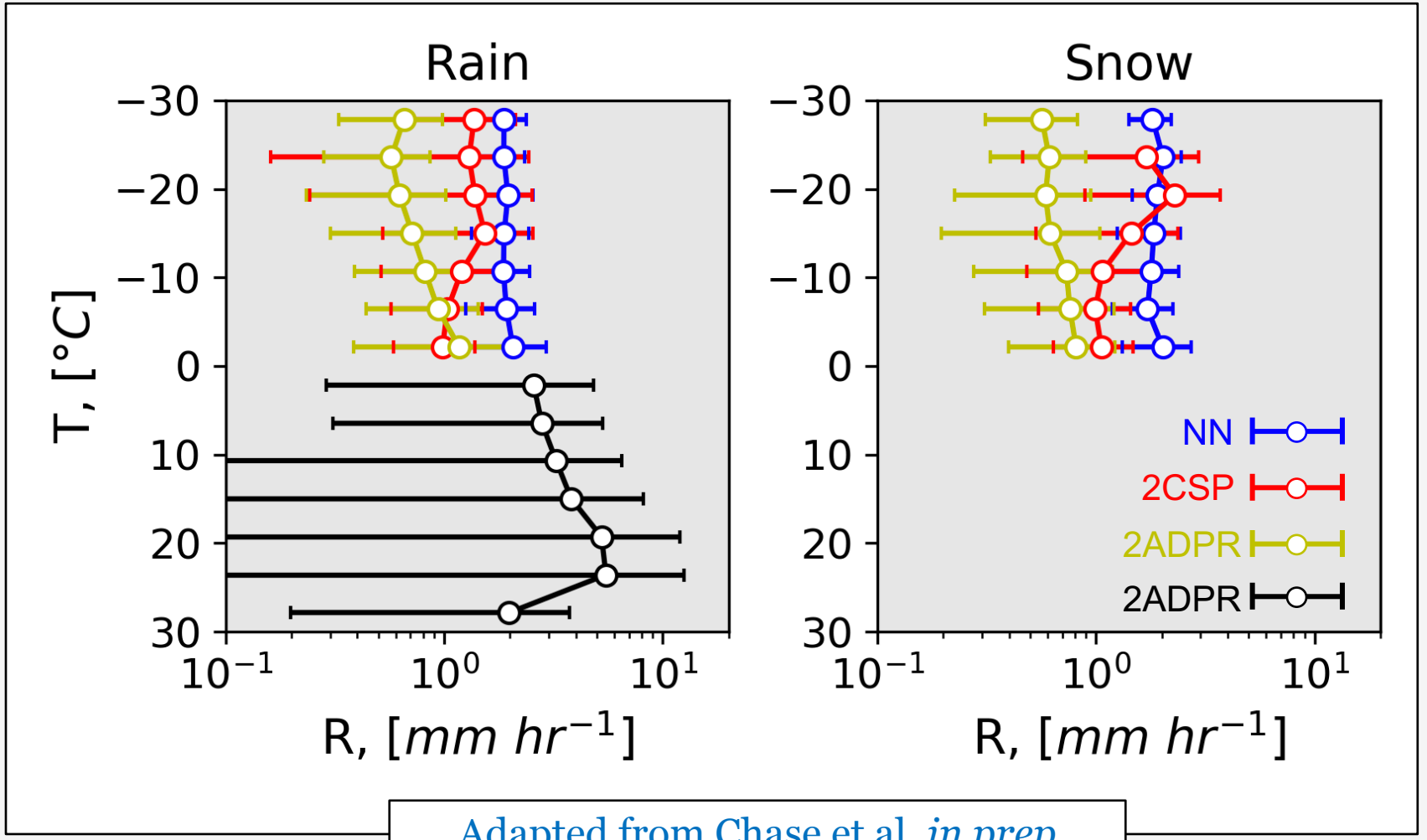


COIN data processing



Adapted from Chase et al. *in prep*

CloudSat Comparison

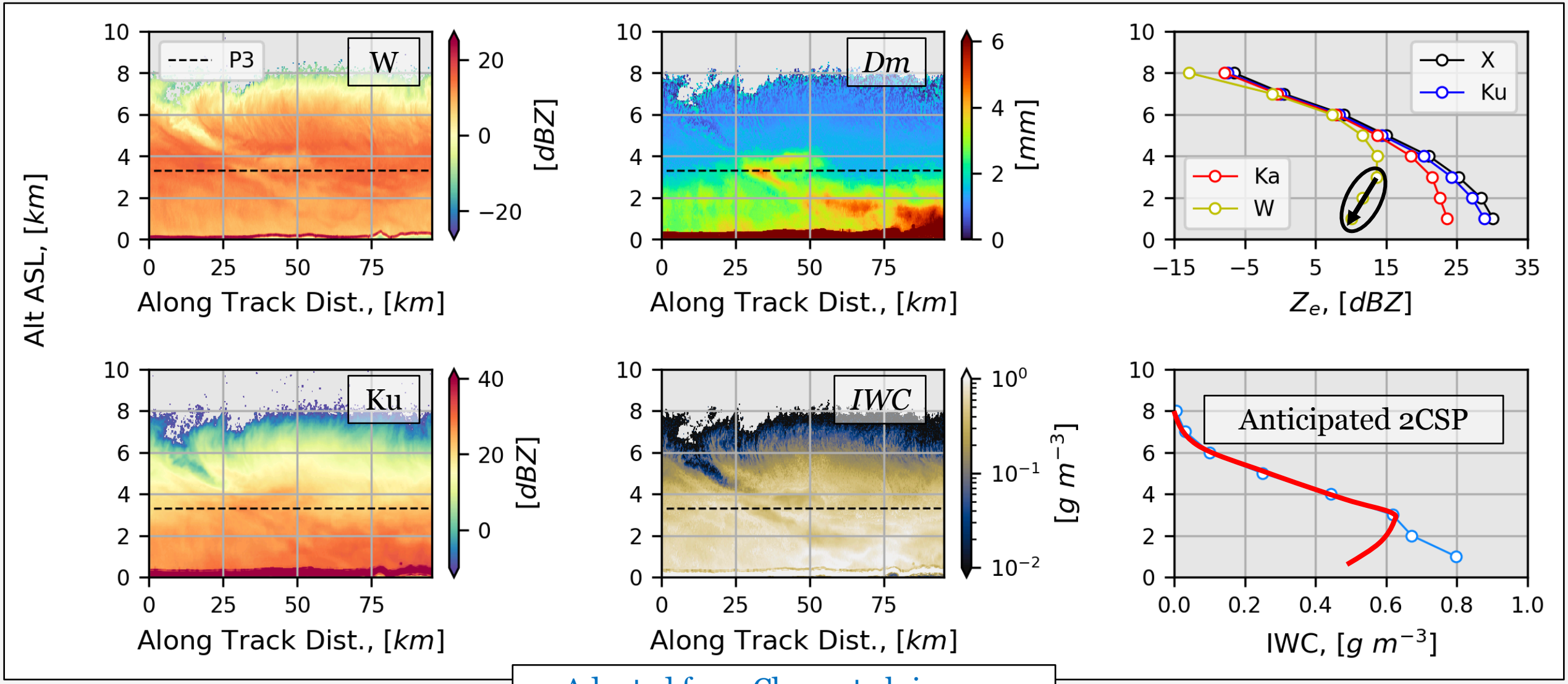


Adapted from Chase et al. *in prep*

Has to have 3 gates of KaPR (>18dBZ) in the profile*

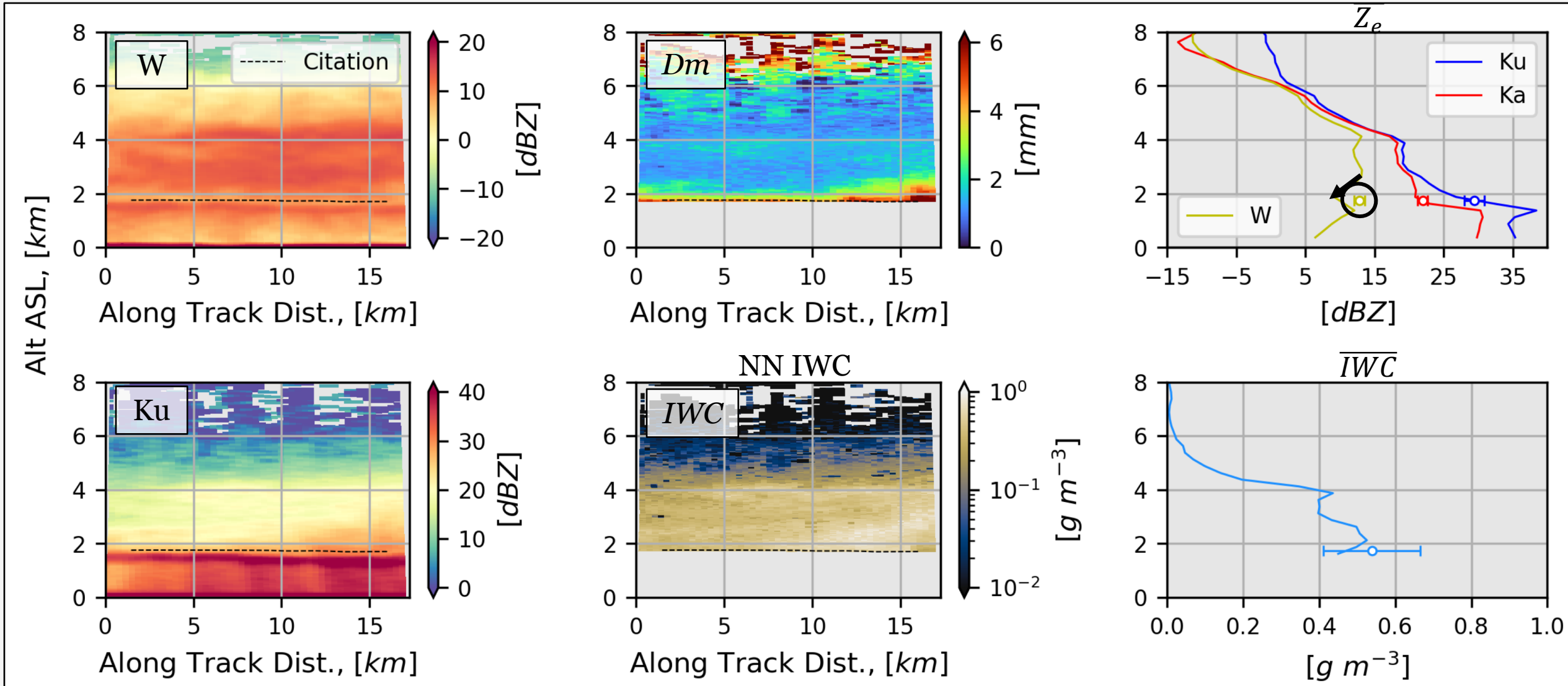
For all stratiform instances where there is KaPR data, 2CSP is lower than our new NN. Meanwhile the NN is closest to the 2ADPR rain

IMPACTS: 07-Feb-2020



Adapted from Chase et al. *in prep*

OLYMPEX Case: 18 December 2015



Adapted from Chase et al. *in prep*

Conclusions

1) We have developed an alternative retrieval method for snow that compares well to NASA GV in-situ

2) The Cloudsat 2CSP retrieval decreases from -15°C to -2.5°C when KaPR > 18 dBZ, while the new retrieval matches best to the rain retrieval

3) Case studies from IMPACTS and OLYMPEX highlight some of the challenges with W-band only retrievals

Chase, R. J., Nesbitt, S. W. and McFarquhar, G. M. 2020 *MDPI Atmosphere*

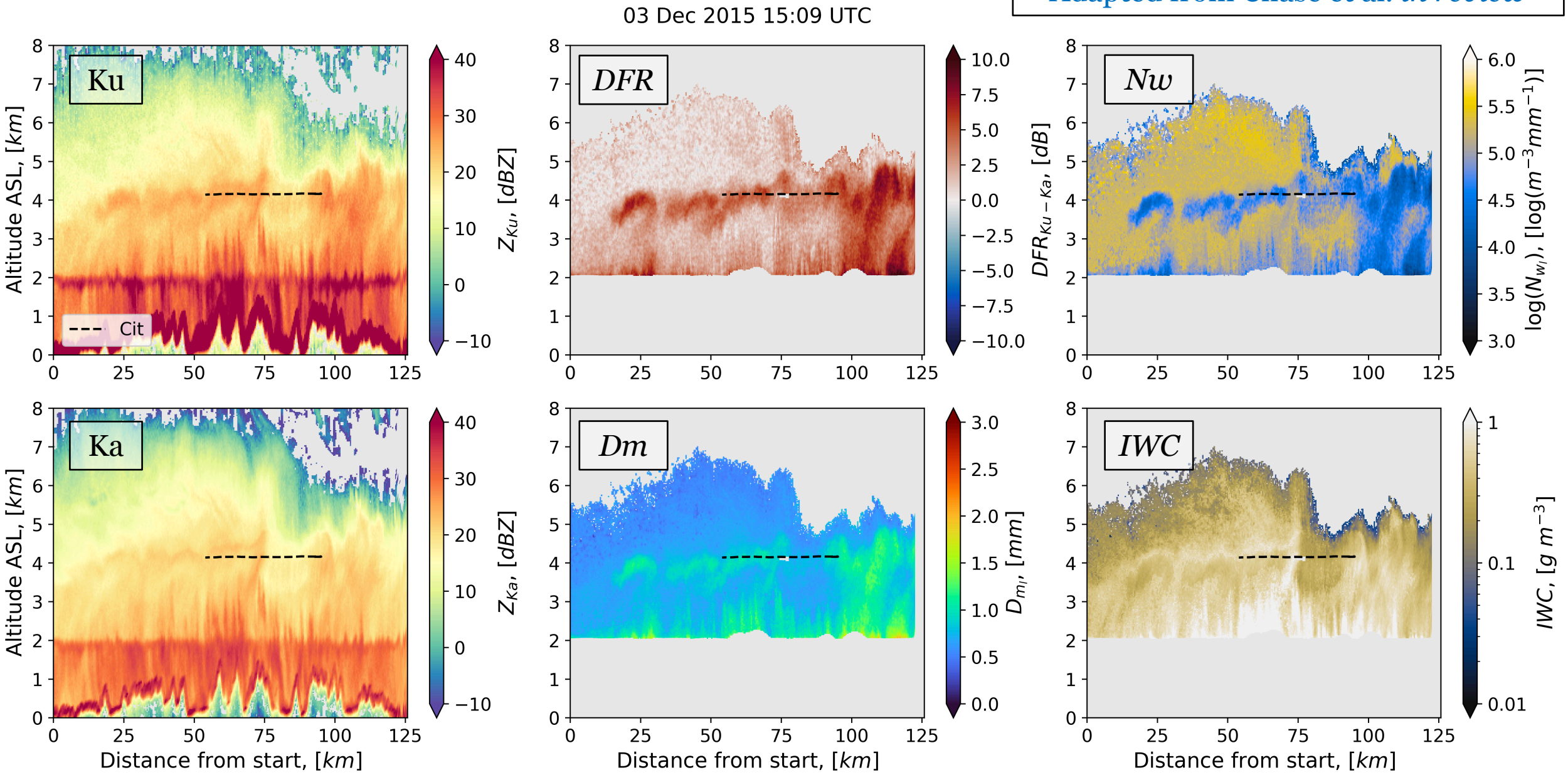
Chase, R. J., Nesbitt, S. W. and McFarquhar, G. M. *in review JAMC*

Chase, R. J., Nesbitt, S. W., McFarquhar, G. M. and Wood, N. *in prep GRL*

Extras

Case Study 3: OLYMPEX 03-Dec-2015

Adapted from Chase et al. *in review*



Case Study 3: OLYMPEX 03-Dec-2015

Adapted from Chase et al. *in review*